

***“SPECULATING ON SELECTED SENTENCES FROM STEPHEN HAWKING’S
BOOKS IN THE LIGHT OF POSSIBLE UNIFICATION”***

Abstract –

Professor Hawking’s sentences appear first, in bold and underlined italics, together with their page number and the book they’re from – either “a Brief History of Time” (published by Bantam Press, 1988) or the book he co-authored with Leonard Mlodinow, “The Grand Design” (Bantam Press, 2010). These sentences are then followed by my speculations.

“If a complete unified theory was discovered, it would only be a matter of time before it was digested and simplified ... and taught in schools, at least in outline. We should then all be able to have some understanding of the laws that govern the universe and are responsible for our existence.”

(“A Brief History of Time” – page 168)

My "... understanding of the laws that govern the universe and are responsible for our existence" hypothesizes that gravity is actually a repulsive force capable of producing both attraction and "dark energy", and that matter (along with the nuclear forces) is formed by gravity's interaction with electromagnetism in wave packets -- so gravitational energy would be unified with electromagnetism as well as matter and quantum probability waves (and, since Einstein said gravity *is* the warping of space, with space and time: space-time). The universe could therefore be more than a vast collection of the countless photons, electrons and other quantum particles within it; it could be a unified whole that has particles and waves built into something ... plausibly, its union of digital 1's and 0's; enabling reality to function like a computer-generated touchable hologram and to be both analog and digital in nature. My article also attempts to specify exactly how gravitons interact with photons.

Keywords – cosmology, quantum physics, gravity, electromagnetism, unification

"... we now have a candidate for the ultimate theory of everything, if indeed one exists, called M-theory." ("The Grand Design", page 8)

M-theory is very complicated, though it certainly possesses a powerful mathematical structure. Is it possible that the ultimate theory of everything is not complex M-theory but can be simplified and described with base-2 mathematics i.e. the binary digits of 1 and 0? To paraphrase John Dobson's book "The Moon Is New", suppose a star we are viewing is at a distance of 100 light years (this can be represented as +100). Since we see nothing as it presently is but as it was when the light left it, we are seeing the star as it was 100 years ago (represented as the opposite of space i.e. as -100). The space-time distance between us and the star is therefore $100 + (-100)$ i.e. $100-100$ i.e. 0 and there is actually zero separation between us and the star's gravity, heat etc. Leaving "The Moon Is New", zero separation and unification are actually possible if we live in a universe that has an electronic foundation. The cosmos would then be comparable to a computer screen. The screen could be divided in two, with one half showing a view that matches zero separation and physics' dream of a universe unified on cosmic and quantum (subatomic) scales ie there would be no separation between us and the star. The other half of the screen would show the picture which our observations and measurements confirm ie we and our planet orbit a star called the sun.

Page 118 of “The Grand Design” says “M-theory (that theory which string theorists now consider fundamental) has solutions that allow for many different internal spaces (the curling up of extra dimensions into tiny, invisible spaces), perhaps as many as 10^{500} , which means it allows for 10^{500} different universes, each with its own laws.”

Suppose there is only one universe with one set of physical laws (a megacosmos that might have an infinite number of local universes, each of which begins with its own Big Bang). 10^{500} would therefore not refer to space and the number of universes but to time (Einstein showed that space and time can never exist independently of each other) and the number of “frames” existing in the cosmos. We can visualise the binary digits as generating information on how things change from one presently undetectably tiny fraction of a second to the next (we call this time, and it's comparable to the frames in a movie). On page 27 of Carl Sagan's “Pale Blue Dot” (Headline Book Publishing, 1995), it is written “There is, in fact, *no* center to the expansion, no point of origin of the Big Bang, at least not in ordinary three-dimensional space.” This truth surely means Big Bangs (or, for the purpose of this article, the generation of binary digits) must occur in a 5th-dimensional hyperspace (time is usually interpreted to be the 4th dimension). Let's go back to space and time never existing independently of each other. This must mean 10^{500} not only describes time and the number of frames in the universe but must also refer to space after all (though not in the sense of 10^{500} parallel universes existing). The article “Universe” by Charles Anthony Federer, Jr. in World Book Encyclopedia, 1967 says “Einstein's theory of relativity implies

that the superuniverse (what I called megacosmos in the previous paragraph) has a definite size.” The superuniverse may therefore not actually be infinite but may e.g. have a radius, diameter, circumference or volume of 10^{500} kilometres, miles, light years, parsecs or the cubes of these measurements. If the universe is so enormously large, space would seem perfectly flat - just as an acre on the surface of large, roughly spherical Earth is flatter than an acre on a spherical asteroid only 10 miles in diameter. The WMAP space probe (Wilkinson Microwave Anisotropy Probe, launched in 2001) has confirmed that space is flat. We are presently unable to detect the closed, positive curvature of space associated with the number 10^{500} and can describe the flat universe that can be detected with the **Mobius loop**, which is one of the two-dimensional spaces described by Euclidean mathematics which is assumed to describe a flat universe. Since separation is zero, the universe must be unified with each of its constituent subatomic particles and those particles must be similarly roughly spherical, composed of space-time-hyperspace, and must also follow the rules of fractal geometry to be made of Mobius loops (see later parts of this article). The Mobius strip is capable of describing the overall nature of the universe because assembling, in correct fashion, enough pieces of flat universe which it sketches results in a spherical cosmos.

As p. 118 of the “Grand Design” states, “To get an idea how many that is, think about this: If some being could analyse (each instant of time in the whole universe) in just one millisecond and had started working on it at the big bang (13.7 billion years ago), at present that being would have studied just 10^{20} of them.”

What’s outside the superuniverse? I don’t think there’s anything at all: it would be a true nothingness, or N-space. Just a vacancy for space-time-hyperspace to expand into as binary digits generate and replicate. For all practical purposes, 10^{500} would equal infinity and the strange thing is – infinity will keep increasing during the eons as bits (BInary digiT^S) do their thing. This is somewhat like the subset of all integers (1, 2, 3, etc.) extending to infinity yet that infinity being smaller than the infinite subset of all decimals.

“And who created him?” (the universe’s/unified theory’s potential creator)
– “A Brief History of Time” – page 174

I'm a fan of the TV series "The Story of Science" (presented by Michael Mosley) and was impressed by the reference in the episode entitled "What is the Secret of Life?" to theoretical physics and biology working together. In 2011, we could combine physics' dream of unifying everything (forces & matter, the whole universe & all time) with today's emerging synthetic biology to create a new understanding of evolution. Evolution would become the modifier, not the originator, of species. To describe origins, I combine this modifier with future science's cosmic-quantum unification and deal with topics like God, synthetic biology and time travel.

Where did we come from? Evolution? God? Or revolution (religious evolution)? On p. 3 it was stated that zero separation and unification are actually possible if we live in a universe that has an electronic foundation. "Physics of the Impossible" by scientist Michio Kaku says -"... the inverse-square law (of famous English scientist Isaac Newton) says that the force between two particles is infinite if the distance of separation goes to zero". Space-time's being a unification whose separation can be reduced to zero also suggests the existence of an infinitely powerful, and infinitely intelligent (since those particles could be brain particles), God. But this also means He/She must form a unification* with humans and be Co-Creator with them. So the answer to "where did we come from" is not exclusively evolution or God but a synthesis I call Revolution.

* (Our brains and minds are part of this unification too, which suggests the possibility that extrasensory perception and telekinetic independence from technology might be possible, despite modern science's objections which appear to be based on non-unification.)

If humanity is Co-Creator of himself/herself, how can we achieve this destiny without 1) synthetic biology, and 2) time travel? Synthetic biology - things such as engineering many genes to work together, artificial DNA, creation of totally new amino acids and proteins and artificial life, and cloning animals - is presently revolutionising our labs. My brief explanation of the coexistence of all times, and of the related topic of time travel (time travel is fantasy to many biologists, but serious stuff to physicists) - It might be helpful to visualise time as the playing of a CD or video tape. The entire disc or tape obviously exists all the time. But our physical senses can only perceive a tiny part of the sound and the sights at any fraction of a second - and we're puzzled by all space and time existing at once. I believe space and time are infinite, so it might be more accurate to visualise time as that HUGE number (10^{500}) - in this case, of CDs or tapes - which string theory's M-theory proposes (how can travel into both the future and past not be possible if ALL time always exists?) CDs themselves could be said to correspond to our spatial and temporal environment along with our bodies and brains. The laser which reads the data on the disc (encoded in a spiral track as a series of tiny indentations called pits) would, in this analogy, correspond to consciousness. The brain's location on the track at any specified instant would be part of the same section illuminated by the laser light of consciousness (this suggests consciousness is permanently linked to, or produced by, the brain – and if retrocausality or backward causality is incorporated, that the brain is produced by consciousness [via synthetic biology]). In a cosmic-quantum unification where all parts of a disc, and all discs, form a unity; it must be possible for consciousness

to read data from anywhere on a disc and to shift its interest from one of the 10^{500} discs to any other (suggesting consciousness is not limited to sensory perception). I doubt either past or future can be changed since 1's and 0's in a unity would continuously feed back on all other binary digits, keeping our pasts and our destinies unalterable to any significant extent (like a digital thermostat regulating a hot water system and keeping the temperature fairly constant).

Page 180 of "The Grand Design" says "Because gravity is attractive, gravitational energy is negative."

I'd regard gravity as repulsive instead of attractive. Repelling gravity would cause the universe to expand – as astronomer Edwin Hubble (1889-1953) confirmed in 1929 – and adding repelling gravity by continual "creation" (actually, recycling) of matter via the small amount from a preceding universe which is used to initiate expansion of its successor would cause it to expand at an accelerated rate.

Page 361 of "Coming of Age in the Milky Way" by Timothy Ferris (The Bodley Head, 1988) tells us the cosmologist Alan Guth once suggested – "You might even be able to start a new universe using energy equivalent to just a few pounds of matter. Provided you could find some way to compress it to a density of about 10^{75} (10 exponent 75) grams per cubic centimeter, and provided you could trigger the thing ..." This accelerating expansion of the universe was discovered in 1998 by observations carried out by the High-z Supernova Search Team and the Supernova Cosmology Project, has been confirmed several times and is claimed to be caused by mysterious "dark energy". Space is expanding at an accelerating rate - and since Einstein showed us that space and time cannot exist independently of each other, time must also be moving faster and faster.

Here's a way to visualise gravity causing cosmic expansion while, at the same time, pushing together planets in a star system (combined with this push, their orbiting speeds stabilise the system and produce the solar system we know). Imagine the universe to be an ocean and each star system to be an island. As ocean waves approach an island, part of the wave feels friction with the increasingly shallow sea-bed resulting in wave refraction or bending. This causes part of the wave to travel in the direction of the shore while part continues on parallel to the shoreline. In the same way, as gravitational waves approach a star system, part of the current in the cosmic ocean feels friction with the increasing mass experienced as planets orbit closer to their star. This causes gravitational refraction or bending in which part of the gravity travels in the direction of the star (this is called the negative component and pushes planets together) while the other part continues on (this is called gravitation's positive component and produces universal expansion when it eventually leaves the relevant group of galaxies). As the refracted gravitational wave heading for the sun passes a planet, part of it is once again diverted by the increased mass (the more mass, the more gravity is diverted* - though the International Space Station weighs around 400 tons, it has tiny mass compared to any planet and produces so-called weightlessness while black holes – ranging from about 3 solar masses for the smallest stellar variety to billions of solar masses for supermassive black holes in galaxy centres – have so much mass and diverted gravity that light pushed into them may be unable to escape). This time gravity is diverted towards the centre of the planet, giving the impression that objects on that planet are

being attracted to the planetary centre. Space would be nothing if it was merely the distances between matter in the universe but can be something, and curved, if it's a product of binary digits from a 5th-dimensional hyperspace. Being curved space, the portion of gravitation that's called dark energy (the portion responsible for universal expansion) would have an amplitude – displacement of a wave equal to half the distance from the top of the wave to the bottom – corresponding to the moving layers of the atmosphere which make the stars seem to twinkle.

* Similarly, there is more mass when ocean currents meet land (islands or continents) than when they exist in bodies of water (lakes or oceans) i.e. land has a greater density than an equivalent volume of water. At the beach, we can see large waves but in Lake Superior, tides are only about 2 inches and are completely masked by changes due to wind and atmospheric pressure (an earthquake underneath the lake would produce large waves). Why do tides follow the moon in its orbit around Earth? It isn't because the moon pulls on the earth but can be explained this way - When the moon is at first or third quarter, gravitational waves heading towards the sun from the outer solar system push against the earth and keep the ocean's water level from rising too high (illustrated by neap or lower tides). On the other side of the planet, a neap tide is experienced because of gravity waves from the opposite side of the solar system which were not diverted into the sun. They traveled past it and are able to push against Earth if they're diverted by the planetary mass. When at the full position, some of those gravity waves from the solar system's edge are diverted by the moon's mass into the lunar interior, and this decrease in gravity's push against the earth permits a spring (high) tide. The Bay of Fundy, on southeast Canada's Atlantic coast, has the highest tides in the world (reaching about 50 feet or 15 metres) but this is due to the unique shape of the bay, strong winds, low atmospheric pressure ... *not* any pull by the sun and moon. At new moon, some gravity waves approaching Earth's satellite from the opposite side of the solar system would likewise allow a spring tide if they're diverted into the moon. This pushing from the edge of the solar system would cause the Pioneer spacecraft to

be closer to Earth than predicted (they're about 7 billion miles away but still within the solar system). Being responsible for Earth's orbit and the planet's momentum, gravity's push could also cause the moon's distance from the earth, or the astronomical unit (Earth's distance from the sun) to increase since there would be no "pull" on the moon by the earth, or on the earth by the sun.

Experiments have shown that the Moon is moving away from Earth at a rate of 38 mm (1.5 inches) per year, and that the astronomical unit is growing by an estimated 5 to 7 cm (2 to 2.8 inches) per year.

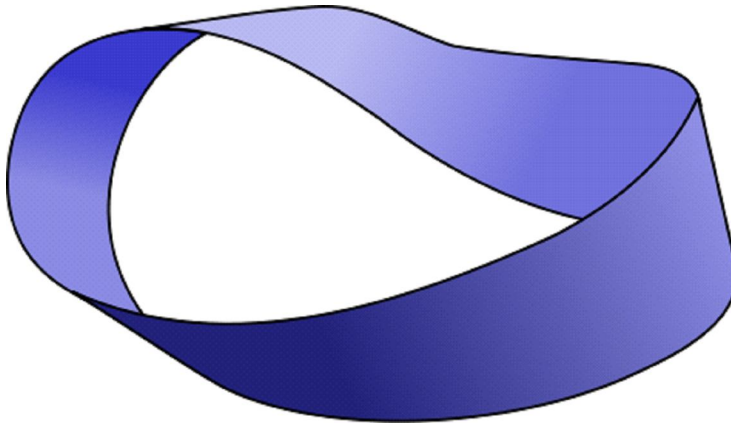
"The Grand Design" informs us on page 125, "It is important to realize that the expansion of space does not affect the size of material objects such as galaxies, stars, apples, atoms or other objects held together by some sort of force." Pages 125-126 further state - "This is important because we can detect expansion only if our measuring instruments have fixed sizes. If everything were free to expand, then we, our yardsticks, our laboratories, and so on would all expand proportionately and we would not notice any difference."

Matter (along with the nuclear forces) may, as suggested at the beginning of this article, be formed by gravity's interaction with electromagnetism in wave packets (a wave packet is a short "burst" or "envelope" of wave action that travels as a unit, and is interpreted by quantum mechanics as a probability wave describing the probability that a particle will have a given position and momentum). Einstein said gravity is the warping of space - therefore, space itself would be a crucial ingredient in the formation of matter (as would time). If time is passing more rapidly, the hands of watches and clocks would move more rapidly. This increasingly rapid movement should be, if not noticeable to human perception, at least detectable by sophisticated scientific instruments.

The key word on page 126 of “The Grand Design” is “proportionately” since our watches and clocks must be expanding if space (gravity) is a crucial ingredient in the formation of matter. However, the expansion would not be detectable if electromagnetism is the other vital ingredient. How does adding electromagnetism reduce matter’s expansion? Electromagnetism is 10^{36} times as strong as gravitation. If it’s converted to anti-electromagnetism (antiphotons), gravity (10^0 or 1) + anti-electromagnetism (10^{-36}) = reduction of expansion by 10^{36} . This means the expansion of, say, a timepiece would be a trillion trillion trillion times less than the expansion of an equal volume of space between two clusters of galaxies (in an equal period). This is many, many billions of times beyond the capabilities of today’s best measuring instruments and, for all practical purposes, the timepiece is fixed in size. How do the force-carrying particles called photons become antiphotons?

(In the case of the force-carrying particles, the antiparticles are the same as the particles themselves.) – p. 68 of “A Brief History of Time” (the following was also inspired by the illustrations and descriptions of particle spin on pp. 66-67 of that book)

An antiphoton would be formed by the fitting together of a force-carrying, spin-2 antigraviton with a spin-1 photon (force-carrying particles called gravitons – predicted to exist but not yet detected - which are diverted towards the sun or into matter are said to be negative, unlike the vast bulk of intergalactic gravity which is positive). And negative gravitons are antigravitons (in 1928 English physicist Paul Dirac proposed that all negative energy states are already occupied by [then hypothetical] antiparticles). Look at the illustration below of a loop (in this case, a Mobius strip). The bottom of it looks like part of a circle while the top has a twist. This particular orientation can be referred to here as “spin 1” – it only looks the same if it’s turned round a complete revolution of 360 degrees, like the Ace of Spades card pictured in “A Brief History of Time” (science is mystified by quantum spin which has mathematical similarities to familiar spin but it does not mean that particles actually rotate like little tops). A photon has spin 1 and when it interacts with a graviton or antigraviton (which has spin 2 and looks the same if turned round 180 degrees or half a revolution, like the double-headed Queen of Spades in “A Brief History of Time”), the particles’ orientations are the same. (A spin 2 particle would have a twist at the top, like a spin 1, either if it’s rotated 180 degrees or if it’s not rotated at all).



_____ Möbius loop

If oriented the same way, the waves undergo constructive interference and reinforce to produce a massive W^+ , W^- or Z^0 that must be turned 360 degrees to look identical i.e. it has spin 1. Slight imperfections in the way the Mobius loops fit together determine the precise nature of the binary-digit currents and therefore of exact mass or charge. If oriented dissimilarly, they undergo destructive interference and partly cancel (there's little or no twist now – both top and bottom of the new Mobius resemble parts of a circle) to create a massless, chargeless gluon that is identical if turned 360 degrees and similarly possesses spin 1. Quarks combine into protons, mesons and neutrons but are never found in isolation and cannot be observed directly. Should gravitons on Earth always be combined with photons, they'd likewise be incapable of unambiguous detection. (In this explanation, the strong and weak nuclear forces have no existence independently of gravitation and electromagnetism. They could simply be products of graviton-photon interaction: the strong nuclear force - which is 10^{38} times gravity's strength - could be gravity "added to" electromagnetism while the weak nuclear force – 10^{25} times gravity's strength - could be gravity "subtracted from" electromagnetism (identical to the antigravitons of antigravity being added to electromagnetism). The 2nd example assumes combining with 100 billion antigravitons while the 1st assumes the presence of 100 gravitons per electromagnetic photon, and I believe these "assumptions" are justifiable by photon-graviton oscillation or transmutation ... but there's no room for that discussion here).

“Black Holes Ain’t So Black” (heading for Chapter 7, “A Brief History of Time”)

A massive star truly can collapse and explode as a supernova while a gravitational singularity (the place all matter falling into the black hole gathers) would be produced from the collapsing core. What if that singularity is disintegrated by the fantastic pressure? It would become "BITS of space-time" (proposed building blocks of all matter and spacetime that are the Binary digiTS – strings of ones and zeros – from which space and time emerge). In this way, nature would protect us from black holes (as Einstein believed it would) and eliminate their assumed and perplexing properties of infinite density, infinite gravity and infinite spacetime curvature. This also means information is not lost in a black hole and would be another way to resolve the "black hole information paradox" in which scientists Leonard Susskind, John Preskill and Gerard 't Hooft were convinced information is not lost while Stephen Hawking and Kip Thorne maintained that it is. The battle was resolved by the 't Hooft/Susskind holographic principle (this principle, along with Juan Maldacena's related AdS/CFT correspondence [anti de Sitter/conformal field theory correspondence] says it might be possible for all the information in a black hole to also be encoded on the hole's surface area), as well as by Hawking's change of mind and announcement in 2005 that quantum perturbations could cause information to escape from a black hole, and the idea of the multiverse in which it's possible that information entering a black hole is passed from this universe to a parallel universe. Every photon and graviton has both positive and negative qualities (in other words, is composed of strings and anti-strings). As an example - when a graviton strikes a photon, the negativity in the graviton can either interact with the photon's

negative anti-strings and repel it into or away from the black hole or the graviton's negativeness can interact with a photon's positive strings and attract it (either racing past the hole and continuing in space together, or diving into the hole together). If they attract and go into the hole, the negative anti-strings of the new GP boson (graviton-photon composite) may contact the positive strings of a GP particle that entered the other side of the black hole. No doubt many GPs continue experiencing the resulting electrical repulsion with other particles until they reach (a few could even travel beyond) the event horizon. Being a photon joined to a graviton and travelling out from the black hole's centre to its boundary or beyond, not only would the brightness of a "white hole" be produced internally but so would anti-gravity, while Hawking radiation (Stephen Hawking's 1974 prediction that black holes slowly evaporate into photons and other particles) is produced externally.

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